PRINZ & PARTNER GbR
European Patent Attorneys
European Trademark Attorneys

Manzingerweg 7
D-81241 Munich
Te.: +49 8989 6980
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TRW Occupant Restraint Systems GmbH
& Co KG
Industriestrasse 20
D-73553 Alfdorf

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KI/rd

Side-Airbag Restraint System

The invention relates to a side-airbag restraint system comprising an airbag which largely covers the side windows of a front and a rear occupant and which, when unfolded, demonstrates a bottom edge and at least one large-area, inflatable restraint chamber.

Such a restraint system is known from EP 0 924 122 A1. The bottom edge of the airbag described therein has a hose-like extension which runs parallel to the bottom edge and is inserted into a long stretched-out hose, which shortens during the expansion in order to have a bracing effect. The known large-area airbag, which extends from the A-pillar to the C-pillar, is supposed to unfold quickly through this hose and the stretched-out extension of the airbag, the airbag also being filled through this extension. It must be expected, however, that the filling time of this airbag is very high.

The invention creates a side-airbag restraint system in which the large-area airbag unfolds quickly, but is also rapidly inflated completely. In a side-airbag restraint system of the abovementioned type, this is achieved in that the restraint chamber demonstrates an open, bottom longitudinal end over its entire longitudinal extension

and, on the longitudinal end, transitions directly into a bottom chamber running along the bottom edge, and that there is provided a bracing hose, which is arranged in the bottom chamber and through which gas is introduced into the restraint chamber, and that the bracing hose is gas-permeable in the vicinity of the restraint chamber and shortens during the inflation. In the restraint system according to the invention, the airbag is filled over its bottom edge and over the entire longitudinal extension of the chamber, not, as in the state of the art, only at one location, so that the unfolding process proceeds substantially faster. The bracing hose is furthermore arranged in the interior of the airbag, not, as in the state of the art, externally to the airbag, making it possible to dispense with the numerous fasteners, provided in the state of the art, between the bracing hose and the airbag itself.

According to a preferred embodiment, separate restraint chambers are provided for the front and rear occupants, and the bottom chamber connects the restraint chambers to one another. This reduces the volume to be filled with gas.

One embodiment provides that the longitudinal ends of the bracing hose are connected to the A- and the C- or D-pillar of the vehicle, so that a horizontal bracing of the airbag will occur on its bottom edge.

The bracing hose can consist of a fabric woven at an angle to the longitudinal extension so that the hose will shorten when widening, as in a net.

Another way to achieve a longitudinal shortening of the hose is to configure it with alternately thickened and narrowed sections.

The airbag is preferably fastened to the roof frame along its top edge so that it is also braced between its top and bottom edge.

Other features and advantages of the invention will arise from the following description and the following drawings, to which

reference will be made. The drawings show:

Figure 1 a longitudinal section through a first embodiment of the side-airbag restraint system according to the invention,

Figure 2 a longitudinal section through a second embodiment of the side-airbag restraint system according to the invention, and

Figure 3 an enlarged view of a modification of the side-airbag restraint system according to the invention in the vicinity of the connection of the gas generator to the bracing hose, and

Figure 4 a variation of the bracing hose.

Figure 1 shows a side-airbag restraint system in an installed, activated state. The restraint system demonstrates a large-area airbag 7, which almost completely covers the side window 3 for the front occupant and the side window 5 for the rear occupant and which demonstrates two large-area, inflatable chambers 9 and 11 for the front and rear occupants, respectively. A single-layer fabric 13 connects the chambers to one another and demonstrates, on its top edge, openings 15 through which the airbag is fastened to the roof frame 17. The chambers 9, 11 have a wide bottom end 19, 21, which is open over the entire longitudinal extension and transitions into a bottom chamber 23, which runs horizontally and extends over the entire length of the airbag 7.

The entire bottom chamber is interwoven by a bracing hose 25 made of a fabric material of high gas permeability, the bracing hose 25 consisting of alternating thickened and narrowed sections 27 and 29, respectively, so that it shortens during the inflation.

The bracing hose runs within an extension 31 of the airbag 7 to a gas generator 33, to which the airbag 7 and the bracing hose 25 are connected.

The bottom edge of the airbag 7, labeled with reference character 41,

is connected to a brace point 45 on the A-pillar 43 on one side and to a brace point 49 on the C-pillar 47 on the other side.

In the folded state, the airbag is accommodated under a paneling (not illustrated) of the C-pillar 47 of the roof frame 17 and of the A-pillar 43.

When the gas generator 33 is activated, the gas flows over the extension 31 into the bracing hose 25 and the bottom chamber 23. The bottom chamber 23 and the bracing hose 25 unfold so that they pull the entire airbag 7 out of the paneling and move it downwards to rapidly cover the side windows 3, 5. As the arrows show, the gas flows essentially horizontally along the chamber 23 and the bracing hose 25, a portion of the gas flow also reaching the chambers 9, 11, however, with a small time delay in order to fill them.

The thickened and narrowed sections 27, 29 cause the bracing hose 25 to shorten its length so that the bottom edge of the restraint system becomes taut and the airbag 7 is positioned in a stable manner. The bottom edge 41 of the airbag lies on the window breast 51 so that it can also serve as head protection for very small occupants or children.

Due to the special design, the restraint system requires neither a firing channel that prescribes the unfolding direction nor a gas lance.

The embodiment according to Figure 2 corresponds to that shown in Figure 1 up to the connection of the gas generator 33, so that only this detail will be described. The gas generator 33 is arranged underneath the C-pillar 47 and is flow-connected to the interior of the airbag 7 by a flexible filling hose 51. But the gas generator 33 can also be arranged in the vicinity of the A-pillar 43, or two gas generators can be positioned on the A- and C-pillars 43, 47 to fill the airbag simultaneously.

Figure 3 shows that the gas generator 33 can also be provided in the interior of the airbag 9 and bracing hose 25.

The bracing hose 25 does not have to be composed of thickened and narrowed sections 27, 29 in order for its length to shorten, it also being possible for it to be manufactured out of a fabric shown in Figure 4 which has threads 61, 63 which run perpendicular to the longitudinal extension A of the bracing hose 25 so that the bracing hose 25 can widen very strongly and thereby shorten. The fabric material in this embodiment is usually very gas-permeable, this gas-permeability not being disadvantageous because of the arrangement of the bracing hose 25 in the interior of the airbag.

The bracing hose 25 does not necessarily have to be made of an extremely gas-permeable fabric, it also being possible to provide a relatively gas-tight fabric so that the bracing hose 25 can extend out of the airbag 7, such as for connecting to the A and C pillar or to the gas generator 33. However, discharge openings, which in Figure 2 are exemplarily indicated by the reference character 71, must then be provided in the region where the bottom chamber 23 transitions into the restraint chambers 9, 11.

It is also conceivable that the bracing hose 25 does not completely fill up the bottom chamber 23, so that an intermediate space can arise and the gas first reaches the bracing hose 25 and then the bottom chamber 23, where it disperses uniformly to finally reach the restraint chambers 9, 11.

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Claims

1. Side-airbag restraint system
comprising an airbag (7) which largely covers the side windows (3, 5) of a front and a rear occupant and which, when unfolded,
demonstrates a bottom edge (41)
and at least one large-area, inflatable restraint chamber (9, 11),
characterized in that
the restraint chamber (9, 11) demonstrates an open, bottom longitudinal end (19, 21) over its entire longitudinal extension and, on the longitudinal end (19, 21), transitions directly into a bottom chamber (23) running along the bottom edge (41), and
that there is provided a bracing hose (25), which is arranged in the bottom chamber (23) and through which gas is introduced into the restraint chamber (9, 11), and that the bracing hose is gas-permeable in the vicinity of the restraint chamber (9, 11) and shortens during the inflation.

2. Side-airbag restraint system according to claim 1, characterized in that a separate restraint chamber (9, 11) is provided for the front and rear occupant respectively, and that the bottom chamber (23) connects the restraint chambers to one another.

3. Side-airbag restraint system according to claim 1 or 2, characterized in that the longitudinal ends of the bracing hose (25) are connected to the A-pillar and the C-pillar (43, 47) of the vehicle.

4. Side-airbag restraint system according to one of the preceding claims, characterized in that the bracing hose (25) is made of a fabric whose threads (61, 63) run at an angle to the longitudinal extension (A).

5. Side-airbag restraint system according to one of the preceding claims, characterized in that the he bracing hose (23) consists of alternating thickened and narrowed sections (27, 29).

6. Side-airbag restraint system according to one of the preceding claims, characterized in that the airbag (7) is fastened to the roof frame (17) along the top edge.